

**Tempe Fire Department Policies and Procedures**  
**Ground Ladders**  
**405.05**  
**Rev 4-27-92**

**CONSTRUCTION**

The primary material used in the construction of Tempe Fire Department ground ladders is aluminum. Aluminum, as found in fire department ground ladders today, is a heat-treated alloy. This is done to give greater strength for relative weight of the section. Heat-treated strength, however, can be reversed by exposure to elevated temperatures. Exposure of approximately 200°F can begin molecular changes which can lead to a loss of structural integrity. The higher the temperature, the less time exposure is required to make this change.

All ground ladders are constructed with the same basic parts; two beams having rungs spanning the distance between them. The end of the ladder contacting the ground is the butt, and the end that rests against the building is the tip.

Roof ladders have hooks at the tip end that can be unfolded and placed over the ridge of a roof, providing a safety platform to work from on a roof.

Extension ladders have two or more sections. A halyard, or rope with pulley assembly, is used to extend the ladder. Ladder locks (dogs) secure the fly section(s) to the bed portion of the ladder in the extended position.

Some ladders come with padded "feet" that swivel into position when the ladder is raised. These "feet" are a safety feature that are designed to grip pavement to prevent the ladder from slipping; they must be deployed to work properly.

**PROPER LADDER POSITION FOR CLIMBING**

Tempe Fire Department ground ladders shall be used in the fly out (away from building) position. This is in compliance with manufacturers' recommendations and NFPA Standard 1932. In the fly out position, the fly section tends to tighten its hold on the base section. When used inverted, the fly section tends to pull away from the base section, and all tolerances are then at their maximum. This could make the fly section slip.

A simple and effective way to determine if a ladder is set at the proper angle for climbing is as follows:

- A. With the ladder raised, take a position with the toes against the ladder beams.
- B. While standing erect at the base of the ladder and with the arms extended straight out, if the ends of the fingers can touch the rungs or if the hands fall on the rung in a comfortable grasping position, the ladder is set properly for climbing
- C. Do not move the heel of the ladder to reposition it until the ladder halyard has been properly secured.

For safety measures, it is desirable to set a maximum number of firefighters permitted on different size ladders. There is a simple rule for determining the number of persons allowed on ladders. The first digit of the length of the ladder will give you a rule of thumb which will correspond to the number of firefighters permitted on the ladder, i.e., 24' = two firefighters.

To maintain the proper load when climbing a ladder, it is recommended that firefighters space themselves at least 10' apart on the ladder.

**SAFETY**

- A. When working with ladders, always wear helmets and gloves.

- B. When a working hose line is being used on a ladder, hose straps should be placed every 10' with one at the top of the ladder.
- C. When lifting ladders, use the leg muscles to effect the lift instead of the weaker back muscles. For more information regarding proper lifting techniques, see IFSTA 209, Firefighter Occupational Safety.
- D. When working with ladders, safety should be the most important factor. Pay particular attention to any overhead power lines. Aluminum ladders should not be used where there is a possibility of contact with power lines, transformers, etc.
- E. Do not reach through the rungs of extended ladders unless the ladder is secured and halyard properly tied. Keep hands, fingers, and feet clear of the extension sections when raising and lowering ladder flies.
- F. Each ladder must be visually inspected once each month and after every use. This inspection should include an examination of all rungs, beams, butt spurs, locks, bolts, rivets, welds, hooks, and halyards.
- G. The butt-person has charge of ladder operation; he spots the ladder and gives all commands for its use.
- H. While carrying ladders, beware of overhang to rear.
- I. Raise on flat surfaces whenever possible.
- J. When climbing, keep back straight, perpendicular to ground using a hand-over-hand method on rungs, always maintain three-point contact (hands and feet) with rungs, or beam and rungs.
- K. Never carry anything but small tools in hand while climbing. Larger equipment must be carried with straps or raised to roof by alternative methods.  
  
To carry small tools while climbing; place tool against beam, span tool and beam with hand, and slide hand up beam while maintaining constant contact with beam.
- L. Ladder must always be braced by another firefighter while climbing.
- M. Use bangor knot to secure fly section to bed ladder in extended position. The bangor knot is tied around the rungs, preventing the ladder from collapsing should the ladder locks malfunction.

## **LOCKING IN**

It is sometimes necessary to perform work from a ladder that requires the use of both hands. The following guidelines are presented to provide a safe, easy method of locking in to a ladder.

The leg lock provides security on a ladder and makes it possible to have both hands free. Ascend the ladder to the desired height, pass one leg through the ladder over the second rung above the one you're standing on, then bring your foot back through the ladder and hook it on the beam. Then step down one rung with the other foot. The leg lock is made opposite the side on which the work is to be performed.

(Refer to video: Tempe Fire Department Standard Ground Ladder Raises.)

## **LADDER CARRIES AND RAISES**

### **10' Attic Ladder** (one-person carry)

Location: All apparatus.

Uses: For gaining access to small confined spaces; e.g., attics.

Operation: Remove ladder from apparatus and carry on in collapsed position.

To raise, place in desired location and open ladder, engaging safety catch.

To lower, reverse procedure.

Make sure that fingers are clear of rungs when folding and unfolding.

#### **14' "A" Frame Ladder** (one-person carry)

Location: All ladder companies.

Uses: As a small step ladder.

As a small extension ladder.

Operation: Remove from apparatus, locate balance point and swing right arm through rungs, carrying ladder on right shoulder, fly section in.

To raise, lower butt of ladder to ground; brace bottom of beam with right foot and span opposite beam with right hand.

With left hand, either raise fly section to desired height for use as an extension ladder or engage upper lock and spread fly section away from base section for use as a step ladder. Make sure that the locking device is completely engaged.

To lower, reverse the procedure. When used as an extension ladder, be sure to lift the bottom of the fly section away from the base section when lowering to prevent the locking mechanism from binding.

#### **14'/16' Roof Ladder** (one-person carry)

Location: 14' - All engine companies.  
16' - All ladder companies.

Uses: Gaining access to roofs of average height residential structures.

Operation: Remove from apparatus, locate balance point, and swing right arm through rungs. Carry ladder on right shoulder butt to the front and slightly lower than tip. Grasp most convenient rung with right hand.

To raise, grab rung ahead with left hand. Using right elbow on inside of ladder beam, level ladder into a flat raise position.

Position ladder butt at bottom of building, "walk rungs" toward building, raising ladder.

Adjust for proper climbing angle by walking ladder backward with ladder tip maintaining contact with building.

To lower ladder, keep tip in contact with building and move butt of ladder to base of building.

"Walk rungs" down to balance point. Swing left arm through rungs and carry ladder on left shoulder away from building, tip first.

**14'/16' Roof Ladder to Roof** (two-person carry)

Location: 14' - All engine companies.  
16' - All ladder companies.

Uses: Use as a safety platform for vertical ventilation.

Operation: Remove from apparatus, carry with top beam on right shoulder between first and second rungs from each end. Hook end faces forward, hooks closed.

- . Carry to the base of the climbing ladder.
- . Front firefighter opens the hooks so they face outward.
- . Replace ladder on shoulder between first and second rung.
- . Proceed up ladder using both hands to climb.
- . When top of climbing ladder is reached, the top firefighter locks in and places the ladder over the edge of the roof.
- . The lower firefighter continues to climb while being assisted with the roof ladder by the top firefighter.
- . When the roof ladder reaches a point of balance at the eave of the roof, the lower firefighter locks in. The ladder is rotated so the hooks are down and both firefighters assist in placing the ladder in position for use.
- . To lower, reverse operations, shouldering the ladder on the left shoulder. Carry the ladder back to the truck, tip first.

**24'-28' Extension Ladder** (two-person carry)

Location: 24' - Most engine companies.  
28' - Ladder companies.

Uses: Roof access, single story buildings, second floor window access.

Operation: Flat Carry (from ladder truck)

Remove ladder from apparatus - fly will be up. Butt-person carries ladder on right shoulder, tip-person carries ladder on left shoulder.

Butt person chooses location for placement.

At approximately 5' from placement location, butt-person grasps lower rung with left hand and lowers the butt to the ground at the desired location.

The tip-person rotates the ladder clockwise from the horizontal position to the vertical, supporting the bottom beam on his left shoulder as the butt-person assists.

Rotation to the fly-out position is completed. Note: When laddering windows, position ladder to left side of window so those climbing ladder will step off ladder on right side.

To raise, butt-person stands on bottom rung, grasps convenient rung with both hands and leans, aiding tip-person with raise by counter-balancing.

With ladder overhead and fly section down, tip-person "walks rungs" raising ladder to near vertical position. Note: Lean ladder slightly toward building - if ladder should fall, it will fall toward building - not away.

Butt-person positions self to raise fly section by placing right side of body into ladder beam. Tip-person spans outside of beams with hands and places foot against bottom of beam. Raise fly by pulling hand-over-hand on halyard.

After ladder locks (dogs) are set, lower ladder slowly to building by having butt-person span edge of both beams with "V" of hands and shuffle feet backwards. Tip-person spans beams with hands, places foot on bottom rung, and directs ladder into building.

Butt-person secures halyard by tying bangor knot.

To lower the ladder, the butt-person unties the halyard. The ladder is then moved away from the building to the vertical position and lowered, reversing the raising procedure.

The butt-person then stands on the bottom rung to counter-balance the weight of the ladder as the tip-person walks backward with his arms extended and back straight, supporting the ladder by the beams and/or rungs.

As the tip of the ladder is reached, the tip-person reaches over the right beam and grasps the top rung as he pivots 180° and grounds the ladder.

The ladder is then rotated 180° on the ground.

At the command of the butt-person, the ladder is shouldered (the back is kept straight and the leg muscles are used), and the ladder is carried back, tip first, and replaced on the truck.

#### Vertical Carry

Remove ladder from apparatus with fly section facing towards body.

Carry ladder on right shoulder with right arm between second and third rungs.

Butt-person chooses location for placement.

At approximately 5' from placement location, butt-person grasps top beam with left hand and lowers ladder to hip level.

Ground ladder on beam end, rotate ladder for flat raise with fly down.

Tip person grasps top beam with left hand and uses right elbow on inside of lower beam for rotation.

To raise, butt-person stands on bottom rung, grasps convenient rung with both hands and leans, aiding tip-person with raise by counter-balancing.

With ladder overhead and fly section down, tip-person "walks rungs" raising ladder to near vertical position Note: Lean ladder slightly toward building -- if ladder should fall, it will fall toward building - not away.

Butt-person positions self to raise fly section by placing right side of body into ladder beam. Tip-person spans outside of beams with hands and places left foot against bottom of beam. Raise fly by pulling hand-over-hand on halyard.

After ladder locks (dogs) are set, lower ladder slowly to building by having butt-person span edge of both beams with "V" of hands and shuffle feet backward. Tip-person spans beams with hands, places foot on bottom rung, and directs ladder into building.

Butt-person secures halyard by tying bangor knot.

To lower the ladder, the butt-person unties the halyard. The ladder is then moved away from the building to the vertical position and lowered, reversing the raising procedure.

The butt-person then stands on the bottom rung to counter-balance the weight of the ladder as the tip-person walks backward with his arms extended and back straight, supporting the ladder by the beams and/or rungs.

As the tip of the ladder is approached, the tip-person shoulders the ladder on his left shoulder as he pivots 180°. The butt-person assists as the ladder is rotated.

The butt-person moves to the right side of the ladder and faces away from the tip-person. The ladder is lifted by the beam and shouldered on the left shoulder as the butt-person pivots.

The ladder is replaced on the truck.

To move ladder a short distance, bring ladder to vertical position and lower fly section. Facing each other, place left hand on beam and right on rung. Lift ladder and proceed in desired direction. Person walking forward guides person walking backward.

To lower ladder to ground while carrying, place left hand on top beam, lower ladder to ground on bottom beam. Rotate ladder to flat position with fly section down.

Safety Tip: Flex knees, keeping back straight to prevent injury.

### **35' Extension Ladder** (three-person carry)

Location: All ladder companies.

Uses: For gaining access to the roof of two-storied buildings and windows of three-storied buildings.

Operation: To remove from apparatus, one person is at butt and two persons are at the tip. After removal, position a tip-person on each side of ladder, four rungs from tip. Carry ladder ready for flat raise with fly section up, butt-person on left side.

Approximately 10' from spot, butt-person reaches up with left hand grasps rung and lowers ladder to hip level. At desired location, butt-person grounds ladder.

Left side tip-person initiates rotation (ladder must be rotated so fly will be out when raised) by pressing left beam to vertical position. Right tip person receives beam at the vertical position and completes rotation. Butt person assists in stabilizing the ladder during rotation.

Tip people raise ladder by placing outside hand on beam and inside hand on rung, walking ladder to vertical position.

Butt-person places right side of body against beam for stabilization. Tip people place inside foot against beam, but out of way if fly section should accidentally fall, and span outside of beam with both hands.

Butt-person pulls halyard hand-over-hand until ladder reaches two to three rungs past roof line or wall height. Insure that ladder locks are set.

Lower ladder to building. Butt-person keeps a straight back and arms with "V" of hands on beams, shuffling feet backwards. Tip people place inside foot on bottom rung, inside hand on rung, and outside hand on beam, guiding ladder to building. The butt-person secures the halyard with a bangor knot.

To lower the ladder, the butt-person unties the halyard. The ladder is then moved away from the building to the vertical position and lowered, reversing the raising procedure.

The butt-person then stands on the bottom rung to counter-balance the weight of the ladder as the tip-persons walk backward with arms extended and backs straight, supporting the ladder by the beams and rungs.

As the tip of the ladder is reached, the tip-persons reach over the beams and grasp a rung while they pivot 180° and ground the ladder.

The ladder is then rotated 180° on the ground.

At the command of the butt-person, the ladder is shouldered and carried back, tip first, and replaced on the truck.